

A New Approach to Gross Alpha Measurements in Liquid Samples Using Extraction Chromatography and LSC

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A traditional method of gross alpha measurements for liquid samples using gas flow proportional counting suffers from a number of limitations. In order to minimize the problem of self absorption, the volume of sample which can be analyzed is limited by the amount of dissolved solids found in the liquid. Counting efficiency of alpha particles by GPC is 35-40% at best and declines to as low as 10% when 100 mg of solids are left on the counting planchet. Counting times in excess of 1000 minutes are typically required to reach a detection limit of 0.1 Bq/L. Samples containing extremely high levels of dissolved solids may require even longer counting times to achieve the desired detection limit since an even smaller sample size must be used.

Alpha liquid scintillation counting has been proposed as an alternate to GPC for gross alpha measurements. The inherent counting efficiency for alpha particles by LSC is in excess of 90%. Since it does not suffer from self absorption problems, LSC can handle higher levels of dissolved solids. However, the sample size is limited by what can be put into an LSC vial, and so for samples larger than 10 mL, some form of sample concentration must be performed.

Eichrom Industries' Actinide Resin shows excellent uptake for all the actinides and for radium under neutral to slightly acidic conditions. Because of these characteristics it is a good candidate to preconcentrate samples prior to alpha LSC. A method has been developed which combines this resin and alpha liquid scintillation counting to measure total alpha activity in water samples. The method is fast and simple. As many as 20 samples can be processed in 24 hours, requiring only 1 to 2 hours of hands-on time. Using 100 mL samples, a detection limit of 2 pCi/L can be reached with only 60 minutes counting time.